

# Detection of Volatile Crystals Mixed with Regolith (CMIST)

Completed Technology Project (2012 - 2016)



## Project Introduction

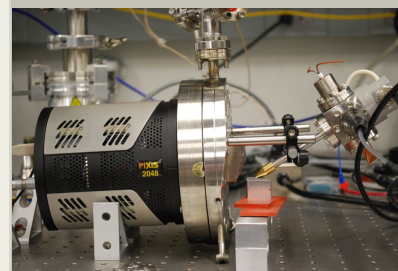
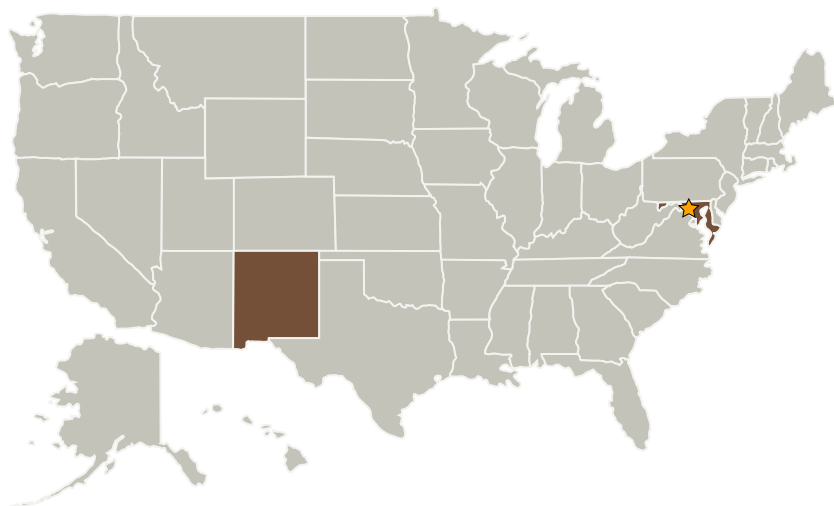
We have built a brass-board combination contact XRD/X-ray fluorescence (XRF) instrument, CMIST (Chromatic Mineral Identification and Surface Texture), that provides chemical composition as well as unique crystal "texture" analyses to determine crystal locations, sizes, and orientations, including volatiles, for unprepared samples within minutes of initiating a measurement. We will evaluate CMIST's capability to detect volatile crystals.

Contact X-ray diffraction (XRD) is an area of technology development with an advantage over traditional XRD in that no sample preparation (e.g., crushing and sieving) is required. We have built a brass-board contact XRD/X-ray fluorescence (XRF) device, CMIST (Chromatic Mineral Identification and Surface Texture), that provides chemical and unique crystalline "texture" analyses for unprepared samples, revealing surface crystal phases, morphologies, and orientations, including for volatiles. We will evaluate CMIST's capability to detect volatile crystals mixed within regolith, to assess the chemistry of briny crystals and the regolith component.

## Anticipated Benefits

The lack of moving parts and sample preparation requirements, coupled with the instrument's small size, make this an ideal tool for use during future human or rover exploration missions.

## Primary U.S. Work Locations and Key Partners



Laboratory model of CMIST.

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
University of New Mexico-Main Campus	Supporting Organization	Academia Hispanic Serving Institutions (HSI)	Albuquerque, New Mexico

## Primary U.S. Work Locations

Maryland	New Mexico
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## Project Transitions

▶ **September 2012:** Project Start

✓ **October 2016:** Closed out

**Closeout Summary:** The purpose of the Goddard Space Flight Center's Internal Research and Development (IRAD) program is to support new technology development and to address scientific challenges. Each year, Principal Investigators (PIs) submit IRAD proposals and compete for funding for their development projects. Goddard's IRAD program supports eight Lines of Business: Astrophysics; Communications and Navigation; Cross-Cutting Technology and Capabilities; Earth Science; Heliophysics; Planetary Science; Science Small Satellites Technology; and Suborbital Platforms and Range Services. Task progress is evaluated twice a year at the Mid-term IRAD review and the end of the year. When the funding period has ended, the PIs compete again for IRAD funding or seek new sources of development and research funding or agree to external partnerships and collaborations. In some cases, when the development work has reached the appropriate Technology Readiness Level (TRL) level, the product is integrated into an actual NASA mission or used to support other government agencies. The technology may also be licensed out to the industry. The completion of a project does not necessarily indicate that the development work has stopped. The work could potentially continue in the future as a follow-on IRAD; or used in collaboration or partnership with Academia, Industry and other Government Agencies. If you are interested in partnering with NASA, see the TechPort Partnerships documentation available on the TechPort Help tab. <http://techport.nasa.gov/help>

## Organizational Responsibility

**Responsible Mission Directorate:**

Mission Support Directorate (MSD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Center Independent Research &amp; Development: GSFC IRAD

## Project Management

**Program Manager:**

Peter M Hughes

**Project Manager:**

Brook Lakew

**Principal Investigator:**

Jacob E Bleacher

**Co-Investigator:**

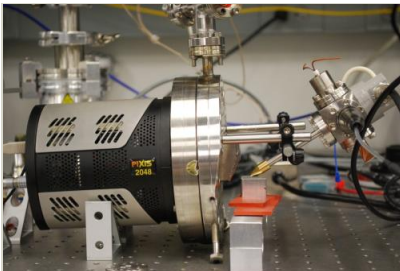
Kongpop U-yen

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## Images



### CMIST

Laboratory model of CMIST.

(<https://techport.nasa.gov/image/36902>)

## Links

Patent Link 1

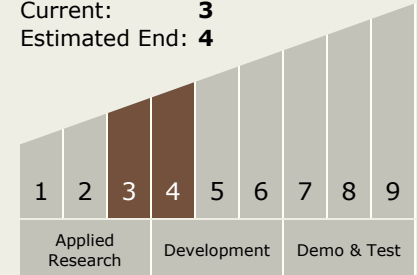
(<http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO1null=HITOFFnull=PG01null=1null=/netahtml/PTO/srchnum.htmlnull=1null=Gnull=50null=20110007869.PG&NR.>)

NTR 1

(<https://ntr.ndc.nasa.gov>)

## Technology Maturity (TRL)

Start: **3**  
Current: **3**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors